Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB.

Vol. 2. *February, 1900.* *No. 14.*

CONTENTS:

Boston, Mass. 740 Exchange Building. | Providence, R. I. Preston & Rounds Co.

The Heintzemann Press, Boston

RHODORA. — A monthly journal of botany, devoted primarily to the flora of New England. Price $1.00 per year ($1.25 to all foreign countries except Canada); single copies, 15 cents. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be gladly received and published to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than one page of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscript and proof to

B. L. ROBINSON, 42 Shepard Street, Cambridge, Mass.

Subscriptions, advertisements, and business communications to

W. P. RICH, 3 No. Market Street, Boston, Mass.

Single copies may be had from

E. L. RAND, Corresponding Sec'y N. E. Botanical Club,
740 Exchange Building, Boston, Mass.

Entered at the Boston, Mass., Post-office as Second Class Mail Matter.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 2 February, 1900 No. 14

THE BLACKBERRIES OF NEW ENGLAND.

Ezra Brainerd.

It is now somewhat over a year since Professor L. H. Bailey published his admirable revision of the Blackberries of Eastern North America. We have had time to consider, in a tentative way, to what extent his disposition of the species clears up the difficulties of our New England forms, and to get some preliminary notion of the number and range of our species.

The genus is especially interesting because of its economic value. Thousands of acres of blackberries are now under cultivation, and the improved varieties are a welcome addition to our table delicacies. At the same time no group of flowering plants has furnished so many stumbling-blocks to the botanists. These two facts have a logical connection. For, as Darwin long ago pointed out, those plants that reward most the efforts of the horticulturist to improve them, are the plants that vary most in the wild state, and consequently most perplex the systematic botanist. Indeed, in the history of the blackberry problem the horticulturist has in several instances recognized new species and varieties, and named them in advance of the botanist. "Bartel," "Snyder" and "Lucretia" are older names than *Rubus invisus*, *sativus* or *roribaccus*.

In the Old World the genus is noted for its multiplicity of forms. The English bramble, *Rubus fruticosus*, L., is the analogue of our blackberry; in Hooker's Flora of the British Islands it is divided into twenty-one sub-species, and under these twenty more forms are described as varieties. In Garcke's Flora of Germany we find thirty-eight species and twenty varieties. Our American blackberry is so

excessively variable, that in order to be completely understood, it may in time need to be presented under as many mental types. But we most sincerely hope that only experts—after years of study—will attempt it. Meanwhile we shall have accomplished much if we can seize hold of the dominant types. These are distinct enough and cover the forms ordinarily met with; and the many intergrading and aberrant forms, that occur here and there, are best understood when viewed in connection with certain well-defined landmarks.

Two general characters of the group should be noticed. First, that though the root is perennial, the growth above ground is biennial. During the first year the cane does not normally bear flowers—only leaves; its function is vegetative. The leaves at this time are best developed and most characteristic. They are usually 5-foliate; those of the second season 3-foliate. It is important that collectors should get specimens of the first season's growth when collecting flowering or fruiting specimens. During the second season the function of the cane is principally reproductive. It flowers and fruits, and in some species propagates by rooting at the recurved tip, and then dies. Now and then, however, a plant seems to have a confused notion of time; the two vital impulses seem to work simultaneously, giving rise to strange and abnormal forms. Sometimes the cane flowers at the close of the first season, the flowers with long pedicels appearing singly in the axils of the upper leaves, and the fruit ripening much later than usual. Other aberrant forms result from excessive leaf-vigor during the second season. This is more likely to occur when the plant grows in the shade; the racemes then have fewer flowers, and the pedicels are more or less subtended by leaves. In a remarkable freak of *Rubus nigrobaccus*, collected by Mr. Fernald at Alstead, N. H., August 7, 1899, this frondose impulse has transformed the sepals into lanceolate, laciniate leaves one or two inches in length. At the same time the pedicels and the axis of the raceme are lengthened, and the fruit reduced to a few drupelets.

The second general character to be noticed is the peculiar mixed inflorescence. The flower cluster is normally a raceme, but cymose to this extent, that it has a terminal flower that opens first of all. This terminal flower is sometimes aborted; but it generally produces a berry, that seems, in the upright species, to have a much shorter pedicel than the other berries of the cluster. Professor Bailey (Evolution of our Native Fruits, p. 332) seems to imply that this mixed inflores-

cence is confined to the dewberry, and may serve to distinguish it from the bush blackberry; but a little observation will show that blackberries and dewberries are alike in this respect. It may be further noted that occasionally the raceme is slightly compound, the lower pedicels developing into two- to several-flowered peduncles. This is common in *R. hispidus* and in *R. nigrobaccus*.

Of the principal forms of blackberries recognized by Professor Bailey in his revision, I find that thirteen occur in New England. Their distinctive marks will be given in the synopsis at the close of this article. But certain preliminary observations regarding range, habitat or synonomy may be of interest to students of the genus.

Rubus nigrobaccus is the name happily coined by Professor Bailey for the common species of "highbush blackberry." The name by which it has been heretofore known, *R. villosus*, was originally given by the English botanist, Aiton, to our common dewberry, and is rightfully restored to that species. *R. nigrobaccus* is the plant that springs up so abundantly in wayside thickets and in clearings, before the stumps are sufficiently rotted for ploughing. It is, however, uncommon at elevations of over a thousand feet, at least in the mountains of Vermont. During a three days' ramble last August over the town of Woodbury (alt. c. 1500 ft.), not a single plant was noticed, though several other species of Rubus were abundant. Occasionally plants occur that produce white or amber-colored berries; this Professor Bailey has marked off as var. *albinus*. But it appears to be rather an abnormal state than a proper botanical variety. At least five stations are reported for Vermont. Two New Hampshire stations are reported in Rhodora I, p. 205.

Rubus allegheniensis, Porter, was first described from the mountains of Pennsylvania, and is reported to be abundant in the Adirondacks. It is said in The Illustrated Flora to be "the characteristic High Blackberry of the mountains of the Eastern and Middle States." A specimen with immature fruit, collected by Dr. B. L. Robinson, at Jaffrey, N. H., July 7, 1897, has all the characters of the species that would appear at that stage of growth. I have distinct recollections of finding in past years certain bushes that bore long, slim, fine-grained, dryish fruit, markedly different from the oval, luscious fruit on neighboring plants. It is hoped that collectors in New England will be on the outlook for this species another season. Professor Bailey remarks that "in its typical form it is very well marked, and seems to be worthy

specific rank; but in intermediate stations it seems to grade into the species," i. e., *R. nigrobaccus*.

Rubus argutus, Link, is the oldest name of the plant described under *Rubus villosus*, var. *frondosus* in the Gray Manual and in Britton & Brown's Ill. Flora. As ordinarily found in western Vermont it is quite distinct from *R. nigrobaccus*, and though not so common it is of wider range, ascending to higher altitudes. But along the seaboard it passes by imperceptible degrees into that species.

Rubus argutus, var. Randii, Bailey. This distinct blackberry, detected first by Mr. Edward L. Rand in 1894, at Mt. Desert, Maine, proves to be common in New England. In habit it differs markedly from *R. argutus*. It affects shady thickets rather than the open; the canes are short, recurving, with few weak prickles or none; not stiff, strict and thorny as in the species. Last summer, in the mountain town of Woodbury, Vt., the fruit was abundant enough to be served at the hotel tables, and though small surely disproved the charge of being "dry and seedy." At lower altitudes the inflorescence, leaf-stalks and leaves beneath are softly pubescent; the glabrous form of the mountain seems nearer to *R. canadensis* than to *R. argutus*.

Rubus canadensis, L. This plant was the first among American species to obtain scientific recognition. Linnæus, in his Species Plantarum of 1753 so christened a specimen collected by the Swedish traveller, Kalm, who several years before had made an extended visit to the French settlements of Lake Champlain and the St. Lawrence. The name, however, was misapplied by American botanists, and the species remained unrecognized until rediscovered in 1890, in the mountains of western Virginia, at an altitude of 3500 feet, and named *R. Millspaughii*, by Dr. Britton, in honor of the collector. It turns out to be a common species in the highlands of New England. In its best estate the canes are ten feet long and an inch in diameter at the base. With its thornless stems, large flowers and juicy fruit, it is by far the most stately and amiable of all our blackberries.

Rubus sativus. This is *Rubus nigrobaccus*, var. *sativus*, Bailey, which we are confident should be regarded as a distinct species. As we find it in western Vermont it is farther removed from *R. nigrobaccus* than any of the four forms last mentioned. In pubescence it is quite like *R. argutus*; it has almost the smoothness of *R. canadensis*, and is even more dwarf than var. *Randii*. It is peculiar in its reduced, leafy flower-cluster, and very broad leaflets. The name chosen by

Professor Bailey is most appropriate, as the species is the parent of some of our best garden varieties.

RUBUS NIGROBACCUS × VILLOSUS, Bailey. This hybrid Professor Bailey finds common in Central New York, and he has so named specimens from a large colony covering a quarter of an acre in Weybridge, Vermont. It has been found in four other towns in western Vermont. We find it difficult to accept this disposition of our Vermont plant, which has more slender bristles, and wider, more glabrous and more sharply toothed leaflets than are found in either of the alleged parents. The botanical status of this plant requires further investigation.

RUBUS CUNEIFOLIUS, Pursh, with leaves whitish pubescent beneath, is a southern species that barely enters New England in southern Connecticut. Specimens seen were from Stratford, East Haven, Killingworth and Milford.

RUBUS SETOSUS, Bigelow (Florula Bostoniensis, 1824). This plant seems to be not rare in the vicinity of Boston, but it has strangely failed of recognition in any edition of the Gray Manual. The stems are usually erect; but trailing forms are not infrequent even in the same colony. It varies also greatly in the width of the leaflet and in the abundance of its bristles. Wide-leaved, prostrate forms are easily mistaken for *Rubus hispidus*. The species appears to be widely distributed in New England.

There remain to be noticed, briefly, our four species of *trailing* blackberries, or dewberries.

RUBUS VILLOSUS, Ait. As noted above, this name must hereafter be applied to what for over a century has been incorrectly passing as *R. canadensis*. It is abundant in the lowlands of New England, in sterile soil; but rare in the mountains and in Maine, north of the coast. The species, though still a variable one, has been much simplified by the segregation of the two following.

RUBUS INVISUS, Bailey, is a plant every way larger than *R. villosus*. Specimens have been seen from Connecticut, Massachusetts and Maine. The Maine plant, collected by Mr. Fernald in Foxcroft, August 31, 1897, is more robust than the types from Ithaca, N. Y., which, through the kindness of Professor Bailey, I have been permitted to examine, has more oval and more sharply toothed leaflets, and may be deserving of varietal distinction.

RUBUS ENSLENII, Tratt., has been identified by Professor Bailey with the *R. villosus* var. *humifusus* of Torrey. With its slender stem

and single flowers on long pedicels it is easily recognized. But it should be noted that in this, as in the two preceding species, the stem is sometimes erect,—recurving if prolonged. The type specimens of Trattinnick were evidently erect; those of Torrey, prostrate. We find eight specimens of this species in the herbaria of the New England Botanical Club, and of Judge J. R. Churchill, — all collected in eastern Massachusetts.

RUBUS HISPIDUS, L., when no longer confused with *R. setosus* is a well-marked species. It seems to be widely distributed in New England. Some authorities describe the fruit as red or purple; but I find it when ripe to be as black as that of its fellow species. The old verbal paradox still holds good, that blackberries are *green* when they are red.

The following synopsis of the blackberries of New England has been carefully prepared, in the hope that it may prove of service in determining the species: —

I. BLACKBERRY PROPER. Canes erect or ascending. (Sometimes prostrate in *R. setosus*.)

A. Plants tall, usually over three feet.

1. Armed with stout prickles.

a. Canes long and curving; new growth glandular pubescent; racemes long, leafless, with divergent pedicels; fruit oblong. *R. nigrobaccus*.

b. Fruit long, narrow, tapering; drupelets numerous and small; branches reddish; gland-tipped hairs abundant. *R. allegheniensis*.

c. Canes strict, shorter; new growth finely pubescent, slightly if at all glandular; racemes shorter, often with leafy bracts at base of lower pedicels; fruit roundish; petals broad. *R. argutus*.

2. Prickles wanting, or if present few and small; leaflets glabrous, on new canes long acuminate. *R. canadensis*.

B. Plants low, usually less than three feet.

1. Prickles stout and numerous; leaves white beneath. *R. cuneifolius*.

2. Prickles slender; leaves green beneath.

a. Prickles short, few or wanting.

(1) Racemes very short, few-flowered, leafy; pedicels and leaves beneath softly pubescent; leaflets broad, terminal one on new canes often orbicular, slightly cordate at base, abruptly pointed. *R. sativus*.

(2) Racemes loosely few-flowered, leafy; lower pedicels remote, long and ascending; leaflets glabrous with irregular teeth. *R. nigrobaccus* × *villosus*.

(3) Racemes short; usually with a rather large simple leaf at base; leaflets glabrous or pubescent, with sharp and unequal teeth, on new canes ovate, acuminate. *R. argutus* var. *Randii*.

b. Usually beset with slightly retrorse bristles, yellowish when young; leaflets glabrous, acute, from ovate to narrowly obovate. *R. setosus*.

II. Dewberry. Stems trailing, but in the first three species occasionally erect, recurving to the ground if elongate.
A. Leaflets oval or ovate, acute or pointed, dull, usually somewhat pubescent beneath; pedicels long and ascending; prickles stiff.
1. Branches few- to several-flowered.
a. Leaflets large, thin, coarsely and simply toothed, terminal one usually rounded at the base; flowers and fruit large; stems stout with tall branches. *R. invisus.*
b. Leaflets firm, sharply and somewhat doubly toothed; plant every way smaller. *R. villosus.*
2. Branches 1-flowered (sometimes 2-flowered); leaflets thin; stems slender, with few minute prickles. *R. Enslenii.*
B. Leaflets obovate, blunt, glabrous, shining; pedicels in flower short, divergent; flowers and fruit small; stems slender, with small, weak bristles. *R. hispidus.*
(Trailing forms of *R. setosus* may be looked for here and may be separated by the acute, dull leaves and larger flowers.)

THE RELATION OF CERTAIN PLANTS TO ATMOSPHERIC MOISTURE.

Robert G. Leavitt.

Orchids. In making some tests of absorption by orchids, in the interests of the scientific side of practical gardening, I was surprised to find little or none of the power of condensing water-vapor which is popularly ascribed to the aërial roots of epiphytes. Not the public alone, but gardeners universally, and botanists pretty generally, regard air-plants as capable of "feeding upon the air." The highest authority, too, may be cited in support of such an opinion. Thus Sachs[1] says, "The walls [of the velamen] are capable of imbibing, and are able to absorb, not only rain and dew but even the vapor of the atmosphere." Kerner,[2] the popularity of whose Natural History of Plants gives his opinions wide vogue, is explicit in the assertion that "the power of condensing aqueous vapor, and other gases as well, is of the greatest importance to these plants." He repeats and amplifies this at considerable length.

The doctrine of vapor-absorption goes back to the experimental work of Unger[3] (1854) and Leitgeb[4] (1864). The contrary view was expressed, after experimentation, by Duchartre[5] (1856). He says that "the leaves do not breathe in the vapor of water diffused in

1 Phys. of Plants, Eng. Tr., 1887, p. 25. 2 Natural History of Plants, Vol. I., p. 222.
3 Physiologie der Gewächse, 1855, p. 307. 4 Denkschr. d. Wiener Akad., 1864, p. 215.
5 Quoted, Bull. de la Soc. Bot. de Fr., 1895, s. 3, t. II, p. 99.

the air, whatever the proportion; and aërial roots are equally devoid of any power of absorbing vapor." Goebel,[1] from extended observation of epiphytes in their native habitats, arrives at the conclusion that absorption of vapor is at any rate not the chief function of aërial roots, and approves Duchartre's opinion. Schimper[2] is equally reserved.

Up to the present moment too little experimental evidence is available to enable one to form a final opinion. It is easy to see possible defects in all the methods employed. For example, cut-off roots, it may be held, are under essentially unnatural conditions. On the other hand if one works with entire plants, transpiration from the shoot and assimilation enter as factors in the loss or gain of weight. Again, the vapor-conditions have been under no sort of control (with one exception to be mentioned). Thus when Kerner writes as follows, one is disposed to attribute the increase of weight to the formation of dew in a closed receptacle, the temperature of which was not guarded against change. He says: "If the aërial roots of *Oncidium sphacelatum* are transferred from a chamber full of dry air to one full of moist air, they take up in twenty-four hours, somewhat more than eight per cent of their weight of water." According to Pfeffer,[3] Sachs probably introduced the same error into his determination of imbibition by dried wood. As to aërial roots Pfeffer is silent, as far as I have read his latest text; but he notes the very indifferent capacity of vegetable tissues in general for acquiring water in the gas-form.

When my first tests were made, with cut roots partially dried in the laboratory and then laid in a moist orchid house, I looked for an addition to the weight. The humidity there was usually from .80 to .85. I found at the end of twenty-four hours, that the roots were drier and lighter than at the beginning.

A large box was then partly filled with sphagnum. This was soaked with water, a glass was placed on the sphagnum, and on this were laid the roots. A wet and dry bulb hygrometer, read through glass let into the end of the box, gave the humidities. Finally the whole was closed in by a sheet of glass, so that the roots had the advantage of light. The ventilation was so adjusted that at no time did the humidity rise above .95, and varied from this down to a bit below .90.

1 Pflanzenbiologische Schilderungen I, p. 188. 2 Pflanzen-Geographie, 1898, p. 343.
3 Pflanzenphysiolagie, last edition, p. 143.

Precipitation of dew was thus wholly precluded, and yet the roots were exposed to the action of a greater proportion of vapor than usually obtains in nature. If at the above humidity the roots were found to be unable to win a supply of water, then it would seem that their condensing power must be unimportant or wanting.

As to the evidence from cut roots, this may be said in favor of its admittance, viz., that the roots of epiphytes, as Schimper points out, play a considerable rôle in assimilation. The growing tips are intensely green, and the parenchyma under the velamen is provided with chlorophyll. In one West Indian *Angraecum*, indeed, the roots have usurped the function of leaves, so that except at the flowering season the plant body consists almost wholly of roots. From the physiological standpoint, therefore, cut roots may be considered fairly perfect wholes.

It must be granted, however, that the point is open to objection; and Dr. Goodale has proposed a method of using whole plants which seems the most satisfactory mode yet devised. Thus far the results obtained by this method accord with those obtained from cut roots.

The genera represented (by twenty-four species) were *Dendrobium*, *Epidendrum*, *Peristeria*, *Scuticaria*, *Laelia*, *Cattleya*, *Burlingtonia*, *Brassavola*, *Cymbidium*, *Brassia*, *Selenipedium*, *Vanda*, *Cypripedium*, *Oncidium*, *Angraecum*, *Masdevallia*, *Odontoglossum*, and *Maxillaria*. From many of the species several different roots were used.

The trials lasted in each case from two to four days, and in a few cases much longer. Some roots were taken from unwatered plants, and after weighing were put at once into the damp-box. Others were left in the laboratory until very dry to the touch, but put to the test while the tips were still green and turgid. The cut ends were usually waxed or otherwise sealed.

In all cases a diminution of weight was ascertained. The shriveling was often astonishing. Control roots from some of the same plants, having access to liquid water, kept vigorous and active in the same box. The manner of the drying up was significant. It began at the cut end and traveled toward the still turgid terminal portion. The latter seemed to be drawing water from the older parts. At any rate the velamen was entirely unable to supply, out of the abundant vapor at hand, the needs of the suffering cells beneath.

Since my work with cut roots was completed, the Centralblatt has

published a paper by Nabokich [1] in which he reaches the same conclusion as Duchartre. Nabokich used cut roots of about a dozen different species, and found in all but one (doubtful) case a slight loss of weight in the saturated atmosphere of a thermostat.

(*To be continued.*)

UNUSUAL VARIATIONS OF TWO COMMON AGARICS.

H. Webster.

To say that *Armillaria mellea* is variable in its appearance is to fall far short of adequately expressing the truth in regard to this common agaric. Like *Laccaria laccata*, it puts on such an extremely unfamiliar look at times that one almost loses faith in the fixity of specific limits. Although typical forms are rarely wanting in its fruiting season, others are always abundant which, in color, surface, size, proportions, and especially in the character of the veil, are more or less striking in the tendency which they show to efface more or less completely some normally essential characteristic. Perhaps the taste is as constant as anything about the plant, and it may often be relied on to resolve a doubt. On the veil and ring no dependence can be placed whatever. Typically strong and fibrous, and even forming a wide-spreading, persistent collar, the veil is sometimes almost or entirely wanting at maturity. In a form found in Cambridge in October, 1898, and shown to the writer, the veil was glutinous and transparent, except immediately about the stem. The fibrous nature of the outer portions could not be detected by the naked eye any more than in the veils of *Cortinarius collinitus* or of *Hygrophorus fuligineus*. The glutinous character of the veil extended to the surface of the pileus which was extremely viscid. The plants were collected after a rain.

From several stations near Boston came reports last autumn of a form of the common *Lepiota naucina*, to which the name of "Smooth Agaric" has been given, in which the pileus was covered with brown scales. In two cases specimens were submitted which showed this character very strikingly, the surface being almost as rough and on the whole darker than is the case in *Lepiota cristata* and similiar species. These forms were growing with others in every way typical. Such an

[1] Bot. Centrbl. LXXX., 1899, p. 333.

extreme variation, however, is not allowed for in the descriptions and, were a group of such forms found in an isolated station, they might easily prove puzzling. Among the specimens submitted were two buttons nearly white at first, which, after lying a few hours in the dry air of a room, turned browner, a part of the surface cracking into scales.

Such instances of variation occurring in common fungi show the necessity, so strongly emphasized by Fries, of keeping close and constant watch of plants in the field from year to year, and they further suggest the possibility that in the case of species of rare occurrence and solitary habit, such as, for instance, *Amanita strobiliformis* and its allies, it may be that forms have been kept separate which should really be closely associated.

LUXURIANT DEVELOPMENT OF SPIROGYRA CRASSA IN REFILLED PONDS.

G. E. Stone.

Spirogyra crassa, Kuetz., one of the largest species of the genus, has been under my observation, more or less, in an incidental manner, for some twelve years. A peculiar trait which I have repeatedly observed, and to which I wish to call attention, is its remarkable abundance under certain conditions. In every instance the unusual abundance of this species was connected with the drawing off the water from artificial ponds, the drying up of the bed, and the subsequent refilling. I know of four instances where ponds have become dry, and in every case there has been a luxuriant growth the following season of this species, not common before in these ponds.

In two cases the locality was the pond in the Public Garden in Boston, the first occurring in 1886, the second a few years later; the third case was that of a small pond at Spencer, Mass., in 1889; the fourth, a pond in the Agricultural College grounds at Amherst, Mass., in 1893. In all these instances the plant was so common that it almost completely covered the surface of the water, at Amherst it became a nuisance, and cartloads of the floating filaments were gathered and carried away. Similar results, to a less noticeable extent, have been observed under similar conditions in ponds in Worcester.

The Spencer and Amherst ponds are contaminated with sewage

and the Public Garden pond has a very muddy bottom. The luxuriant growth may be partly due to this. Yet the fact that the species appeared so regularly and abundantly after the reservoirs had been emptied would seem to indicate that the drying out of the soil constituents of the pond acted as a stimulus to the germination of the spores, which were dormant in the soil. In all of the localities named, this alga was more or less abundant during the second year after the ponds were emptied, although in other years, as already remarked, it was rare or absent.

The ponds being unconnected, the plant could not have originated in one and spread to the others; and the difference in dates excludes general climatic conditions from producing the results.

S. crassa is here taken in the sense in which it is used by Wolle (Fresh Water Algae of the United States). The form found in Massachusetts appears to be fairly distinct, but there may be some doubt in referring it to any particular European form.

Coreopsis involucrata on the Atlantic coast. — Permit me to mention in the columns of Rhodora a plant which seems a good way from home. Several years since, Miss Sarah Fell, an enthusiastic botanist of this city, discovered in the reclaimed tide-water marshes at the junction of Christiana Creek with Delaware River, the southwestern *Coreopsis involucrata* of Nuttall. It was again found in great profusion this year by Mr. Commons, and later by myself, growing along a "marsh road." It is a fine species, not very unlike *C. trichosperma*, Michx., which is also common here. — Wm. M. Canby, Wilmington, Delaware.

[The closely related *C. aristosa*, Michx., has been twice collected on wool waste in New England: by *C. W. Swan* at Dracut, Mass., in 1894, and by *J. C. Parlin* and *M. L. Fernald* at North Berwick, Me., in 1897. *C. involucrata* may be expected in such places. — Ed.]

THE DISTRIBUTION OF CERTAIN TREES AND SHRUBS IN WESTERN CONNECTICUT.

Charles K. Averill.

The following notes on the distribution of certain trees and shrubs in the Housatonic River region of western Connecticut may be of

interest. They should be taken, however, as a preliminary reconnaissance, and not as an attempt to fix definitely the bounds of the species.

From an elevation of about 690 feet at Canaan, the river descends to the sea at Stratford, a distance of about eighty miles. It is throughout a beautiful stream, and the wooded condition of the hills on either side gives a wild aspect to its scenery. But little large timber is seen, as may be expected in a region abounding in lime and containing some iron ore.

Where the Still River enters the Housatonic, *Acer dasycarpum* is seen on the alluvial deposits and at other places in the town of New Milford, particularly in the vicinity of the village of the same name. At Kent it is known as the "river maple." It is common all the way up to Sheffield, Mass., wherever there is any considerable deposit of alluvial soil and is confined to this soil.

The Cottonwood, *Populus monilifera*, is found along the river from tide water to Pittsfield, Mass. It occurs sometimes at a distance of a mile or two therefrom, along highways and open places, but I have not seen it in the woods.

In RHODORA, i. 39, I noted *Populus balsamifera* growing along the river in New Milford. It appears to have been introduced. Recently I went over this ground with Mr. E. H. Austin, to whom I am indebted for much valuable information about the plants of that region. The trees are extended along the river for a distance of five or six miles, but have evidently been derived from a tree set out about sixty or more years ago in front of a house on the east bank about a mile south of Kent village. The original tree has been cut down, but an old lady was found who could remember it. We could get no information as to where it came from. The rapid spread of the tree is interesting, and would be possible only in a tree of rapid growth. I counted the rings in a stump cut off near the ground and about thirty-two inches in diameter. There were thirty-two, showing an increase in diameter of an inch per year.

Two trees, the canoe birch and the larch, show the effect of altitude and latitude in their distribution. Going northward from the coast, the canoe birch, *Betula papyrifera*, is first seen in the northern part of New Milford, where it is common, and from thence north it is a conspicuous tree on many of the hillsides. In the Berzelius List of Plants within thirty miles of New Haven it is given as rare, with three localities specified, viz., Maltby Park, near New Haven, Wallingford, and Wading River, Long Island.

The Larch, *Larix Americana*, is found in the swamps in Brookfield and New Milford, and thence northward. The Berzelius list records it from Danbury, the most southerly point I am aware of.

In the Berzelius list the Black Spruce, *Picea nigra*, Link, was given as follows: "Formerly at Wading River, L. I. 'Twenty years ago there was quite a clump of this spruce near Waterbury, but the trees were all killed by fire.' H. J. Bassett."

Just south of Botsford station on the Berkshire Division railroad, partly in the town of Newtown and partly in Monroe, the railroad passes through a large swamp, at an elevation of about four hundred feet. In winter the spruce trees can be seen from the train. I have never explored the swamp thoroughly, but once I climbed a hill to the west where I could overlook it. Its area appears to be about a square mile, and the spruces are scattered in various parts of it. A few specimens secured show that it is *P. nigra*, Link. This is perhaps the most southerly station in New England.

On the north shore of Spectacle Ponds, in the town of Kent, at an elevation of 1,200 feet, there are a few trees of this species growing in a sphagnum swamp. They were much damaged by an ice-storm two winters ago.

Among the Oaks I have seen *Quercus stellata*, Wang, on the seashore at Milford sparingly, but not away from the coast. *Q. macrocarpa* I have not found in the State of Connecticut; but a few miles over the line in Massachusetts it occurs near a highway a little west of Van Deusenville station; also a few saplings near Stockbridge. It is recorded from Connecticut in Bishop's List of Connecticut Plants. *Q. Muhlenbergia* occurs on the limestone formation in the neighborhood of Kent. *Q. palustris*, Du Roi, is an abundant tree in the low grounds in the vicinity of the coast, but is not common in the northern part of the State, although I have seen it at New Milford and Canaan.

Q. ilicifolia, Wang, occurs abundantly on the higher exposed places of barren hills all through the region. Near the summit of Long Mountain, in the town of New Milford, in a small swamp, are some very large specimens, one of which surpasses any I have heard of. It comes from the ground with a single trunk measuring forty-four inches in circumference. At about fourteen inches from the ground it divides into two branches, the larger of which measures twenty-nine inches round. The branches soon become horizontal and spread widely.

The Greenwich station, for *Liquidambar Styraciflua*, described by Mr. Harger in the July Rhodora, is not the most easterly and northerly station. As given in Bishop's additional list of Connecticut plants, it occurs from Darien to Five Mile River, where reported by Miss A. E. Carpenter. I visited the place last September, and made a hurried examination. The trees were growing plentifully in a piece of wet woods bounded north by the railroad track, and south by the highway on which the trolley runs. Easterly they extend nearly to the Five Mile River. I did not go to their western boundary, but they appeared to extend westerly for at least half a mile. This station is about eight to ten miles easterly from the Greenwich one. Some of the trees were of good size. I measured one six and a half feet round at five feet from the ground. There were many others that looked as large. While this tree has been cultivated somewhat in this region, I should judge this to be a natural station.

Fraxinus sambucifolia, the black ash, which is not given in the Berzelius list, and in Bishop's list is given as rare, I have seen at a number of places from Stratford on the coast, to Stockbridge, Mass., always in wet places, but not usually near the river.

I have mentioned the canoe birch and tamarack as showing the effect of altitude and latitude in their distribution. This is better shown in a number of shrubs which are common in the northern part; rare or lacking in the southern.

Acer spicatum and *Acer Pennsylvanicum* are tolerably common in New Milford, Kent, and in Cornwall, but not south. The Berzelius list gives them as occurring at stations twenty to thirty miles north of New Haven, except *spicatum*, which has a station as far south as North Branford.

Viburnum cassinoides I have seen in a few elevated places in New Milford and Kent; *V. Opulus* in several places from Kent north, also in Brookfield; *V. lantanoides* I have from one station in Kent. None of these have I seen in the southern portion, and they are not in the Berzelius list.

Sambucus racemosa occurs among the higher hills of New Milford; and while not seen in the southern part of the Housatonic region, I have found it at East Rock, New Haven. *Cornus Canadensis* is not rare in swamps about New Milford; it grows also in the swamp with the spruce trees at Botsford. It was formerly found near New Haven.

Potentilla fruticosa is abundant over the northern half of the

region; apparently lacking south of New Milford. *Chiogenes hispidula* and *Kalmia glauca* grow at Spectacle Ponds, Kent; *Andromeda polifolia* at Spectacle Ponds and Hatch Pond; *Cassandra calyculata* as far south as Huntington; and in Berzelius list, at Riverhead, L. I. This is more common and more southerly than the two preceding.

Nemopanthus fasicularis is common around New Milford and Kent in swamps.

Many examples of herbaceous plants could be given corroborating the effect of altitude and latitude, which, however, it will be better to defer till another time.

Bridgeport, Conn.

IS ARTEMISIA STELLERIANA A NATIVE OF NEW ENGLAND?

M. L. Fernald.

One of the most conspicuous plants of sand-dunes and the drier portions of many sea-beaches of New England is *Artemisia Stelleriana*, a species first described from Kamtschatka. Yet, abundant as is the plant about many of our long-visited resorts, Mt. Desert, Old Orchard, Nahant, Nantasket, Truro, Martha's Vineyard, Narraganset Pier, Newport, and New London, as well as Long Reach and Sandy Hook, it was apparently unrecorded in our botanical literature until within the last quarter-century. Probably the first station noted in eastern America was at Nahant, Massachusetts, in 1877. A specimen collected there, or on the adjacent Lynn Beach, by Dr. W. G. Farlow, in 1879, is labelled "growing wild in large tufts," and of this station Mr. John Robinson wrote in 1880, "evidently increasing quite rapidly." A specimen collected by Miss G. H. Learned at New London, Connecticut, in 1892, is marked "well established." These notes of Dr. Farlow, Mr. Robinson, and Miss Learned, then, as well as Dr. Britton's records of the plant in his New Jersey catalogue, indicate their belief that the plant is introduced.

On the other hand, there is a rather general idea that the plant is indigenous on our coast. In the Synoptical Flora and in the last edition of Gray's Manual this is suggested, though with some doubt; in various local floras the plant is treated in the same non-committal way; and in the Illustrated Flora, though its introduction into eastern America

may be inferred, no definite statement to that effect is made, as is done in case of *A. Absinthium*, *A. Abrotanum*, *A. annua*, etc. Thus as treated in standard works the exact status of the species in our flora is not clearly defined.

It is a significant fact that this very conspicuous plant was not seen upon the New England coast until 1877, and that from that date until the present time it has appeared in ever-increasing abundance at points long known and visited by botanists. Furthermore, in 1876, the plant was discovered in dry sand on the coast of Skåne, the southernmost province of Sweden, "the most thoroughly examined province of Sweden from the botanist's point of view;" in 1891 it was found on the sandy coast at North Bull, County Dublin, Ireland; in 1892, on the coast of Zealand, Denmark; and in 1895 on the sands between Penzance and Marazion in Cornwall.

In the Journal of Botany for 1894 and previously in a Swedish journal, *Botaniska Notiser*, Professor Areschoug discussed [1] at length the occurrence of this Kamtschatkan plant in Europe and America, favoring the view that it has long been a member of our flora, until recently overlooked because of its habitat — barren sands which are rarely visited. He further argued that the plant must have spread laterally from northern Asia to Europe and America immediately after the Glacial Period, before the return northward of the flora which now characterizes so much of Europe and America, and that although not yet known to us it will be found in many sandy river-valleys of North America.

Replying to Professor Areschoug's most interesting and ingenious argument, Mr. Nathaniel Colgan showed [2] very conclusively that the extensive colony of the plant found by him in County Dublin had originated from waste fragments thrown upon the sand from a neighboring nursery. The simple explanation given by Mr. Colgan of the origin of the colony in Ireland is essentially applicable to our American stations. If this very conspicuous plant were indigenous upon Old Orchard, Nahant, Martha's Vineyard, and other sandy shores, it is singular that no one observed it before 1877. Mr. Walter Deane informs me that in his youth he was familiar with Old Orchard Beach, and that at that time this *Artemisia* was not seen; in Tracy's list (1858) of the plants of Lynn it is not mentioned, nor does the late Dr. Morong note it in

1 Botaniska Notiser, 1880, 137, and 1893, 111; Journ. Bot. xxxii. 70.

2 Journ. Bot. l. c. 104.

his paper[1] upon the flora of Martha's Vineyard. However, in the seventies *A. Stelleriana* was popular in America, as well as in Europe, as a bedding plant. For a few years it was used very extensively for its mass of gray foliage, and to-day, in many old-fashioned gardens in Maine, it is still a favorite under the name "Dusty Miller." Professor Areschoug argued that because the plant rarely spreads from gardens to the neighboring districts and because it abounds on sand-dunes and beaches remote from gardens it cannot have escaped from cultivation to its present coastal stations. It cannot be stated with assurance that the plant has reached the New England sea-beaches directly from neighboring gardens; but a statement made by a nurseryman, attempting to account for the colony in County Dublin, and quoted by Mr. Colgan in his article above cited may as well apply to our own as to the Irish station: "It is a plant of the freest possible growth. Any bit of the top or rootstock swept out with refuse would be sure to grow.... Tops have often been used for mixing with cut-flowers, and may have assisted in the make-up of breast-bouquets, which, worn by some visitor to the North Bull, may have been thrown away as withered, and have got covered with sand." In view, then, of the very striking habit of the plant, its sudden appearance on sea-beaches and sand-dunes, especially in the neighborhood of summer resorts, soon after its period of popularity as a bedding plant, and its probable absence from our flora prior to that time, there seems no doubt that *Artemisia Stelleriana* was originally introduced along our coast and that we have no reason longer to regard it as a species native to New England.

Gray Herbarium.

Plant Relations,[2] by Prof. J. M. Coulter of the University of Chicago, is a clear and terse statement of the biological relations of plants to each other, to their inorganic environment, and to animals. It thus presents what are doubtless the most fascinating or, as one may say, the most sensational aspects of plant life. The illustrations are numerous and excellent both as to clearness and artistic effect. In fact they are, as in some of our current magazines, so copious and striking as to distract the attention and impair the power of concentrating upon the text.

[1] Field and Forest, iii (1878), 119.

[2] Octavo, vii and 264 pp. copiously illustrated and well indexed. Appleton & Co., 1899.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS, — V. MARINE ALGAE.[1]

Frank S. Collins.

[**The sign + indicates that an herbarium specimen has been seen; the sign — that a printed record has been found.**]

The State of Vermont, having no coast line, is omitted in this list. Massachusetts, however, is divided into two parts, northern and southern, as the most strongly marked division line for algae on the whole Atlantic coast occurs here. As regards the marine flora, Nahant and Nantucket differ more from each other than the former does from Newfoundland, or the latter from Fortress Monroe. The division line is usually given as Cape Cod, but as the flora of the inside of the lower cape is the same as that of Vineyard Sound, the latitude of Provincetown has been taken as the boundary.

Among the Schizophyceae will be found some species usually classed as fresh water algae; but as they were found growing among undoubted marine species, it seemed best to include them.

Schizophyceae.

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Amphithrix janthina (Mont.) Born. & Flah.			+			
" " var. torulosa (Grunow) Born. & Flah.			+			
" violacea (Kuetz.) Born. & Flah.	+				+	+
Anabaena torulosa (Carm.) Lagerh.	+	+	+	+	+	+
" variabilis Kuetz.					+	+
Brachytrichia Quoyii (Ag.) Born. & Flah.				+		
Calothrix aeruginea (Kuetz.) Thuret.	+		+			+
" confervicola (Dillw.) Ag.	+	+	+	+	+	+
" crustacea Thuret.	+	+	+	+	+	+
" fasciculata Ag.	+		+		+	
" " forma incrustans Collins			+			
" fusco-violacea Crouan.				+		
" parasitica (Chauv.) Thuret.	+	+	+	+	+	+
" pulvinata (Mert.) Ag.	+		+	+	—	+
" scopulorum (Web. & Mohr) Ag.	+	+	+	+	+	+
" vivipara Harv.			+		+	
Chroococcus turgidus Naeg.	+		+	+	+	+
Cryptoglaena Americana Davis.			+			
Dermocarpa prasina (Reinsch) Born. & Thuret.	+		+		+	+
" violacea Crouan.					+	
Entophysalis granulosa Kuetz.	+			+		+
" Magnoliae Farlow.	+		+			
Gloeocapsa crepidinum Thuret.	+		+	+	+	+

[1] Printed in Rhodora as supplementary material.

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Hydrocoleum glutinosum (Ag.) Gomont.			+	+		+
" lyngbyaceum Kuetz.			+	+		
" " var. rupestre Kuetz.	+					
" majus Holden.						+
Hyella caespitosa Born. & Flah.	+		+	+	+	+
Isactis plana (Harv.) Thuret.				+		+
Lyngbya aestuarii (Mert.) Liebm.	+	+	+	+	+	+
" confervoides Ag.				+	−	+
" gracilis (Menegh.) Rab.	+					
" Lagerheimii (Moebius) Gomont.						+
" lutea (Ag.) Gomont.	+		+	+	+	+
" majuscula (Dillw.) Harv.		+	+	+	+	+
" semiplena (Ag.) J. Ag.	+	+			+	
" subtilis Holden mss.	+					+
Mastigocoleus testarum Lagerh.	+		+	+	+	+
Microchaete grisea Thuret.	+			+		
Microcoleus chthonoplastes (Fl. Dan.) Thuret.	+	+	+	+	+	+
Nodularia Harveyana (Thwaites) Thuret.	+	+	+			+
" spumigena Mert. var. litorea (Kuetz.) Born. & Thuret.	+	+	+			
" " var. major (Kuetz.) Born. & Flah.						+
Oscillatoria amphibia Ag.			+			
" Corallinae (Kuetz.) Gomont.						+
" laetevirens Crouan.	+				+	+
" limosa Ag.	+				+	+
" margaritifera Kuetz.			+			
" nigro-viridis Thwaites.	+		+			
" princeps Vauch.			+		+	+
" tenuis Ag.					+	
Ostreobium Quekettii Born. & Flah.						+
Phormidium ambiguum Gomont.			+			
" autumnale (Ag.) Gomont.			+		+	
" Corium (Ag.) Gomont.			+			
" favosum (Bory) Gomont.					+	
" fragile (Menegh.) Gomont.	+		+			
" persicinum (Reinke) Gomont.			+			
" Valderianum (Delponte) Gomont.					+	+
Plectonema calothrichoides Gomont.			+			
" Golenkinianum Gomont.	+					
" terebrans Born. & Flah.					+	+
Pleurocapsa fuliginosa Hauck.			+		+	+
Polycystis elabens Kuetz.	+	+	+	+		+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Polycystis pallida (Kuetz.) Farlow.	+		+	+	+	
Rivularia atra Roth.	+	+	+	+	+	+
" Biasolettiana Menegh.		+	+	+	+	
" Bornetiana Setchell.					+	+
" nitida Ag.	+		+	+		+
Spirulina Meneghiniana Zan.			+			
" Nordstedtii Gomont.	+					
" subsalsa Oersted.	+	+	+	+		+
" versicolor Cohn.	+					
Symploca hydnoides Kuetz.				+	+	
Xenococcus Schousboei Thuret.	+		+			+
CHLOROPHYCEAE.						
Acroblaste Reinschii Wille.	+		+	–		
Bolbocoleon piliferum Prings.	+		+	+	+	
Bryopsis plumosa (Huds.) Ag.	+	+	+	+	+	+
Chaetomorpha aerea (Dillw.) Kuetz.			+	+	+	+
" Linum (Fl. Dan.) Kuetz.	+	+	+	+	+	+
" Melagonium (Web. & Mohr) Kuetz. forma typica Kjellm.	+		+			+
" Melagonium forma rupincola Aresch.	+	+	+			+
Chlorochytrium Schmitzii Rosenvinge.	+					
Cladophora albida (Huds.) Kuetz.				+	+	
" " var. refracta Thuret.	+		+	+	+	+
" arcta (Dillw.) Kuetz.	+	+	+	+	+	+
" " var. centralis Farlow.	+					
" expansa (Mert.) Kuetz.	+	+	+	+		+
" flexuosa (Griff.) Harv.	+	+	+	+	+	+
" fracta (Fl. Dan.) Kuetz.			+	+	–	
" glaucescens (Griff.) Harv.	+	+	+	+	+	
" gracilis (Griff.) Kuetz.	+	+	+	+	+	+
" " var. expansa Farlow.			+			
" " " tenuis Farlow.			+			
" hirta Kuetz.			+	+	+	
" Hutchinsiae Kuetz.			+			
" " var. diffusa (Harv.) Farlow.			+		+	
" laetevirens Kuetz.	+	+	+			
" lanosa (Roth) Kuetz.	+		+	+	+	+
" " var. uncialis (Harv.) Thuret.		+	+		+	+
" Magdalenae Harv.					+	+
" refracta Aresch.	+	+	+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Cladophora Rudolphiana (Ag.) Harv.	+			+	+	+
" rupestris (L.) Kuetz.	+	+	+		–	+
Codiolum gregarium A. Br.	+		+	+		
" longipes Foslie.	+					
" Petrocelidis Kuckuck.	+					
Derbesia vaucheriaeformis (Harv.) J. Ag.				+		
Enteromorpha clathrata (Roth) J. Ag.	+	+	+	+		+
" " var. Rothiana (Le Jolis) Farlow.			+			
" compressa (L.) Grev.	+		+	+	–	
" crinita (Roth) J. Ag.	+		+		+	+
" cruciata Collins.	+					
" erecta (Lyng.) J. Ag.	+	+	+	+	+	+
" Hopkirkii McCalla.	+	+	+	+		+
" intestinalis (L.) Link.	+	+	+	+	+	+
" " forma cylindracea J. Ag.			+	+	+	+
" " forma maxima J. Ag.			+			+
" Linza (L.) J. Ag.	+	+	+	+	+	+
" marginata J. Ag.			+		+	+
" micrococca Kuetz.	+		+			
" " var. subsalsa Kjellm.			+			
" minima Naeg.	+					+
" percursa (Ag.) J. Ag.	+	+	+	+		+
" prolifera J. Ag.	+		+	+	+	+
" ramulosa (Eng. Bot.) Hook.			+			
" torta (Mert.) Reinbold.	+					
Entoderma Wittrockii (Wille) Lagerh.			+			+
Epicladia Flustrae Reinke.	+	+	+			+
Gloeocystis zostericola Farlow.				+		
Gomontia polyrhiza (Lagerh.) Born. & Flah.	+		+	+	+	+
Ilea fulvescens (Ag.) J. Ag.	+	+	+	+		+
Monostroma crepidinum Farlow.			+	+	+	+
" fuscum (Post. & Rupr.) Wittr.	+	+	+			
" Grevillei (Thuret) Wittr.	+		+	+	+	+
" Groenlandicum J. Ag.			+			
" latissimum (Kuetz.) Wittr.			+	+		+
" leptodermum Kjellm.			+			
" pulchrum Farlow.			+		+	+
" undulatum Wittr. var. Farlowii Foslie.			+			
" Vahlii J. Ag.			+			
Pilinia maritima (Kjellm.) Rosenvinge.	+					

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Prasinocladus subsalsus Davis.			+			
Pringsheimia scutata Reinke.	+			+		+
Protoderma marinum Reinke.						+
Rhizoclonium Kerneri Stockmayer.	+	+	+			
" riparium (Roth) Harv. var. implexum Rosenvinge.	+	+	+	+	+	+
" riparium var. polyrhizum Rosenvinge.	+				+	+
" tortuosum Kuetz.	+	+	+	+		+
" " var. polyrhizum Holden.						+
Schizogonium laetevirens Kuetz.	+					
Ulothrix collabens (Ag.) Thuret.			+			
" flacca (Dillw.) Thuret.	+	+	+	+	+	+
" implexa Kuetz.			+	+	+	+
" variabilis Kuetz. var. marina Wille.						+
Ulva Lactuca (L.) Le Jolis.	+	+	+	+	+	+
" " var. mesenteriformis (Roth) Collins.						+
" " var. rigida (Ag.) Le Jolis.	+	+	+	+	+	+
Urospora penicilliformis (Roth) Aresch.	+	+	+	+	+	+
Vaucheria litorea Nordst.	+		+	+		+
" piloboloides Thuret.						+
" " var. compacta Collins.			+			
" Thuretii Woronin.	+		+	+		+
PHAEOPHYCEAE.						
Agarum Turneri Post. & Rupr.	+	+	+			
Alaria esculenta (L.) Grev.	+	+	+		+	
" Pylaii Grev.	+		+			
Arthrocladia villosa (Huds.) Duby.				+	+	
Ascocyclus orbicularis (J. Ag.) Magnus.	+	+	+	+	+	+
Ascophyllum Mackaii (Turn.) Holmes & Batters.				+		+
" nodosum (L.) Le Jolis.	+	+	+	+	+	+
Asperococcus echinatus (Mert.) Grev.	+	+	+	+	+	+
Castagnea virescens (Carm.) Thuret.	+	+	+	+	+	+
" Zosterae (Mohr) Thuret.	+		+			
Chorda Filum (L.) Stack.	+	+	+	+	+	+
" tomentosa Lyng.			+	+	+	
Chordaria flagelliformis (Fl. Dan.) Ag.	+	+	+	+	+	+
" " var. densa Farlow.			+		+	
Cladostephus spongiosus (Lightf.) Ag.				+	+	
" verticillatus (Lightf.) Ag.				+	+	+
Desmarestia aculeata (L.) Lamour.	+	+	+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Desmarestia viridis (Fl. Dan.) Lamour.	+	+	+	+	+	+
Desmotrichum Balticum Kuetz.	+					+
" undulatum (J. Ag.) Reinke.	+	+	+	+	+	+
Dictyosiphon Ekmani Aresch.	+		+			
" foeniculaceus (Huds.) Grev.	+	+	+	+	+	+
" " var. Americanus Collins.				+	+	+
" hippuroides (Lyng.) Aresch.	+	+	+		+	
" " var. fragilis (Harv.) Kjellm.	+		+			
" hispidus Kjellm.	+		+			
" Macounii Farlow.	+					
Ectocarpus aecidioides Rosenvinge.	+		+		+	
" confervoides (Roth) Le Jolis.	+	+	+	+	+	+
" " var. hiemalis (Crouan) Kuckuck.			+	+		
" " var. subulatus Hauck.						+
" " var. brumalis Holden.						+
" dasycarpus Kuckuck.				+	+	
" elegans Thuret.				+		
" fasciculatus Harv.	+	+	+	+	+	
" granulosus (Eng. Bot.) Ag.			+	+	–	
" " var. tenuis Farlow.		–		+	+	
" lutosus Harv.				+		
" Mitchellae Harv.				+	+	
" ovatus Kjellm.				+		
" penicillatus J. Ag.				+	+	+
" siliculosus (Dillw.) Ag.	+		+	+	+	+
" subcorymbosus Farlow.			+			+
" terminalis Kuetz.		+	+		+	+
" tomentosoides Farlow.			+			
" tomentosus (Huds.) Lyng.	+	+	+	+	+	+
Elachista fasciculata var. major (Reinke) Gran.	+					
" fucicola (Velley) Fries.	+	+	+	+	+	+
" lubrica Rupr.	+					
" stellaris var. Chordae Aresch.				+		
Fucus Areschougii Kjellm.	+		+			
" ceranoides L.				+		+
" edentatus De la Pyl.	+	+	+	+	+	+
" evanescens Ag.	+	+	+	+	+	+
" filiformis Gmelin.	+	+	+			
" platycarpus Thuret.	+		+	+	+	+
" vesiculosus L.	+	+	+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Fucus vesiculosus var. sphaerocarpus Farlow.	+		+			+
" " var. spiralis Farlow.			+	+		+
" " var. gracillimus Collins.				+		
Halothrix lumbricalis (Kuetz.) Reinke.	+		+		+	+
Haplospora globosa Kjellm.				+		
Hecatonema maculans (Collins) Sauvageau.	+		+			
Isthmoplea sphaerophora (Harv.) Kjellm.			+			
Laminaria caperata De la Pyl.	+	+	+			
" digitata (L.) Lamour. var. typica Foslie.	+		+	+	+	+
" " var. complanata Foslie.	+		+			
" " var. ensifolia (Kuetz.) Foslie.	+		+			
" intermedia var. cucullata Foslie.						+
" " var. longipes Foslie.						+
" " var. ovata Foslie.					+	+
" longicruris De la Pyl.	+	+	+		+	+
" Phyllitis (Stack.) Lamour.		+	+	+	+	+
" Platymeris De la Pyl.	+	+	+			
" saccharina (L.) Lamour.	+	+	+	+	+	+
" stenophylla (Harv.) J. Ag.	+		+			
Leathesia difformis (L.) Aresch.	+	+	+	+	+	+
Mesogloia divaricata (Ag.) Kuetz.	+		+	+	+	+
Microspongium gelatinosum Reinke.	+					
Myriactis pulvinata Kuetz. var. minor Farlow.				+		
Myrionema Balticum (Reinke) Foslie.			+			
" foecundum (Stromf.) Foslie.					+	+
" globosum (Reinke) Foslie.			+			
" vulgare Thuret.	+	+	+	+	+	
Myriotrichia clavaeformis Harv.			+	+	+	
" filiformis Harv.	—		+	+	+	
Phaeosaccion Collinsii Farlow.			+			
Phyllitis fascia (Fl. Dan.) Kuetz.	+	+	+	+	+	+
" zosteraefolia Reinke.			+			
Punctaria latifolia Grev.	+		+	+	+	+
" plantaginea (Roth) Grev.	+	+	+	+	+	+
Pylaiella littoralis (L.) Kjellm.	+	+	+	+	+	+
" " var. fluviatilis Hauck.			+			
" " var. robusta Farlow.	+		+	+	+	
" " var. varia Kjellm.	+					
Ralfsia Borneti Kuckuck.	+					+
" clavata (Carm.) Farlow	+	+	+	+	+	
" deusta J. Ag.	+	+	+			

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Ralfsia pusilla (Stromf.) Holmes & Batters.	+		+		+	
" verrucosa Aresch.	+	+	+	+	+	+
Saccorhiza dermatodea (De la Pyl.) J. Ag.	+	+	+			
Sargassum bacciferum (Turn.) J. Ag.				+		
" Filipendula Ag.				+	+	+
" " forma subedentatum J. Ag.				+	+	+
Scaphospora Kingii Farlow.				+		
Scytosiphon lomentarius (Lyng.) J. Ag.	+	+	+	+	+	+
" " var. complanatus Rosenvinge.						+
Sorocarpus uvaeformis Prings.				+		
Sphacelaria cirrhosa (Roth) Ag.			+	+	+	+
" racemosa Grev. var. arctica (Harv.) Reinke.	+					
" radicans (Dillw.) Ag.	+	+	+	+	+	+
Stictyosiphon Griffithsianus (Le Jolis) Holmes & Batters.	+		+			
" subsimplex Holden.						+
Stilophora rhizodes (Ehrh.) J. Ag.				+	+	+
Streblonema Chordariae (Farlow) De Toni	+			+	+	
" fasciculatum Thuret.	+					
" reptans (Crouan) Farlow.			+		+	+
Striaria attenuata Grev.				+	+	
RHODOPHYCEAE.						
Actinococcus subcutaneus (Lyng.) Schmitz.	+	+	+	+	+	+
" aggregatus Schmitz.				+		
Agardhiella tenera (J. Ag.) Schmitz.			+	+	+	+
Ahnfeltia plicata (Turn.) Fries.	+	+	+	+	+	+
Antithamnion Americanum (Harv.) Farlow.			+	+	+	+
" boreale (Gobi) Kjellm.	+		+			
" cruciatum (Ag.) Naeg.				+	+	+
" " var. radicans J. Ag.				+		
" floccosum (Muell.) Kleen.	+		+			
" plumula (Ellis) Thuret.				+	+	
" Pylaisei (Mont.) Kjellm.	+		+		+	
Bangia ciliaris Carm.			+		+	+
" fusco-purpurea (Dillw.) Lyng.	+		+	+	+	+
Bostrychia rivularis Harv.						+
Callithamnion Baileyi Harv.	–		+	+	+	+
" " var. boreale Harv.			+			
" " var. laxum Farlow.				+	+	
" " var. Rochei Harv.				–		

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Callithamnion byssoideum Arn.			+	+	+	+
" " var. unilaterale Harv.			+	+		
" corymbosum (Eng. Bot.) Ag.			+	+	+	+
" " var. secundatum Harv.			−			
" roseum (Roth.) Harv.				+	+	+
" tetragonum (With.) Ag.				+	+	+
Callymenia reniformis (Turn.) J. Ag.			+			
Caloglossa Leprieurii (Mont.) J. Ag.						+
Ceramium arborescens J. Ag.	+		+	+	+	
" Capri-Cornu (Reinsch) Farlow.						+
" circinatum (Kuetz.) J. Ag.						+
" fastigiatum Harv.			+	+	+	+
" Hooperi Harv.	+		+			
" pedicellatum J. Ag.					+	
" rubrum (Huds.) Ag.	+	+	+	+	+	+
" " var. corymbosum J. Ag.			+			+
" " var. decurrens (Kuetz.) Harv.				−		+
" " var. proliferum Harv.					−	+
" " var. secundatum (Lyng.) Harv.	+		+			+
" squarrosum (Harv.) J. Ag.			+			
" strictum (Kuetz.) Harv.	+	+	+	+	+	+
" tenuissimum (Lyng.) J. Ag.				+	+	+
" " var. arachnoideum (J. Ag.) Farlow.			−		+	+
" " var. patentissimum Harv.			−	+	+	
Champia parvula (Ag.) Harv.			+	+	+	+
Chantransia Daviesii (Dillw.) Thuret.	+		+	+	+	
" secundata (Lyng.) Thuret.	+	+				+
" Thuretii Bornet mss.			+	+		
" virgatula (Harv.) Thuret.	+	+	+	+	+	+
Chondria dasyphylla (Woodw.) Ag.				+	+	+
" sedifolia Harv.				+	+	
" tenuissima (Good. & Woodw.) Ag.			+	+	+	+
" " var. Baileyana (Harv.) J. Ag.			+	+	+	+
Chondrus crispus (L.) Stack.	+	+	+	+	+	+
Choreocolax Polysiphoniae Reinsch.	+		+		+	+
Corallina officinalis L.	+	+	+	+	+	+
" " var. profunda Farlow.			+			
" " var. spathulaeformis (Kuetz.) Ardissone.	+				+	
Cystoclonium purpurascens (Huds.) Kuetz.	+	+	+	+	+	+
" " var. cirrhosum Harv.	+	−	+	+	+	+
Dasya elegans (Mart.) Ag.			+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Delesseria alata (Huds.) Lamour.	+	+	+			
" angustissima Griff.			+			
" sinuosa (Good. & Woodw.) Lamour.	+	+	+	+	+	+
Erythrotrichia ceramicola (Lyng.) Aresch.	+		+	+	+	+
Euthora cristata (L.) J. Ag.	+	+	+		+	
Gelidium crinale (Turn.) J. Ag.	–		+	+	+	+
Gigartina mamillosa (Good. & Woodw.) J. Ag.	+	+	+	+	+	
Gloiosiphonia capillaris (Huds.) Carm.	+	+	+	+	+	+
Goniotrichum elegans (Chauv.) Le Jolis.				+	+	+
" ramosum (Thwaites) Hauck.			+			+
Gracilaria multipartita (Clem.) Ag.				+	–	+
" " var. angustissima Harv.			+	+	+	+
Griffithsia Bornetiana Farlow.			+	+	+	+
" tenuis Ag.				+		
Grinnellia Americana (Ag.) Harv.			+	+	+	+
Gymnogongrus Griffithsiae (Turn.) Mart.				+	+	
" Norvegicus (Turn.) J. Ag.	+		+			
Halosaccion ramentaceum (L.) J. Ag.	+	–	+			
" " var. gladiatum Eaton	+					
" Scopula Stromf.	+					
Harveyella mirabilis (Reinsch) Schmitz.	+		+	+	+	
Hildenbrandia Prototypus Nardo.	+	+	+	+	+	+
Hypnea musciformis (Wulf.) Lamour.				+	+	
Lithothamnion circumscriptum Stromf.	+					
" colliculosum Foslie.	+		+			
" compactum Kjellm.	+	+	+			
" evanescens Foslie.	+					
" flabellatum Rosenvinge.	+					
" foecundum Foslie.	+					
" laeve (Stromf.) Foslie.	+		+			
" laevigatum Foslie.	+					
" Lenormandi (Aresch.) Foslie.	+		+			+
" Norvegicum (Aresch.) Kjellm.	+					
" polymorphum (L.) Aresch.					+	
" Ungeri Kjellm.	+					
" " var. fastigiatum Foslie.	+	+				
Lomentaria rosea (Harv.) Thuret.		–	+	+	+	
" uncinata Menegh.			+	+	+	+
" " var. filiformis Harv.				+	–	
Melobesia Corallinae Crouan.				+		
" farinosa Lamour.			+	+	+	
" Lejolisii Rosanoff.	+	+	+	+	+	+
" macrocarpa Rosanoff.			+	+		

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Melobesia membranacea (Esper) Lamour.			+	+	+	
" pustulata Lamour.		+	+	+	+	
Nemalion multifidum (Web. & Mohr) J. Ag.	+	+	+	+	+	+
Nemastoma Bairdii Farlow.				+		
Petrocelis cruenta J. Ag.	+	+	+	+		
Peysonnellia Rosenvingii Schmitz.	+		+			
Phyllophora Brodiaei (Turn.) J. Ag.	+	+	+	+	+	+
" membranifolia (Good. & Woodw.) J. Ag.	+	+	+	+	+	+
" Traillii Holmes.	+	+	+	+	+	+
Pleonosporium Borreri (Eng. Bot.) Naeg.				+	+	+
Plumaria elegans (Bonnem.) Schmitz.	+	+	+	+	+	+
Polyides rotundus (Gmel.) Grev.	+	+	+	+	+	+
Polysiphonia atrorubescens (Dillw.) Grev.			+	+	+	+
" elongata (Huds.) Harv.			+	+	+	+
" fastigiata (Roth) Grev.	+	+	+	+	+	+
" fibrillosa (Dillw.) Grev.			–	+	+	+
" Harveyi Bailey.	+	+	+	+	+	+
" nigrescens (Dillw.) Grev.	+	+	+	+	+	+
" " var. affinis Harv.			+	+	+	+
" " var. Durkeei Harv.				+	+	+
" " var. fucoides Harv.			+	+	+	+
" Olneyi Harv.	+	+	+	+	+	+
" subtilissima Mont.	+		+		+	+
" urceolata (Lightf.) Grev.	+	+	+	+	+	+
" " var. formosa (Suhr) Ag.				+	+	+
" " var. patens (Dillw.) Grev.	+	+	+	+	+	
" variegata (Ag.) Zan.			+	+	+	+
" vestita J. Ag.				+		
" violacea (Roth) Grev.	+	+	+	+	+	+
" " var. flexicaulis Harv.			+	+		
Porphyra coccinea J. Ag.		+				
" laciniata (Lightf.) Ag.	+	+	+	+	+	+
" leucosticta Thuret.			+	+	+	+
" miniata Ag.	+	+	+			
Ptilota pectinata (Gunner) Kjellm.	+	+	+	+	–	+
Rhodochorton membranaceum Magnus.	+	+	+			+
" parasiticum Holmes.		+	+			
" Rothii (Eng. Bot.) Naeg.	+	+	+		+	+
Rhodomela Rochei Harv.				+	+	+
" subfusca (Woodw.) Ag.	+	+	+	+	+	
" " var. gracilis (Harv.) J. Ag.			+	+	+	
" virgata Kjellm.				+	+	

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Rhodophyllis dichotoma (Lepechin) Gobi.			+			
Rhodymenia palmata (L.) Grev.	+	+	+	+	+	+
" " var. latifolia Rosenvinge.			+		+	
" " var. Sarniensis (Mert.) Grev.	+					
Scinaia furcellata (Turn.) Bivona.				+	+	+
Seirospora Griffithsiana Harv.				+	+	+
Spermothamnion Turneri (Mert.) Aresch.				+	+	+
Spyridia filamentosa (Wulf.) Harv.				+	+	+
Sterrocolax decipiens Schmitz.	+				+	+

The Teaching Botanist [1] by W. F. Ganong, Ph.D., of Smith College, is really two books in one. Part I consists of a series of eight essays on botanical pedagogics. These are all good but those on the following topics are pre-eminently valuable: What Botany is of most worth? Things essential to good Botanical Teaching; Botanical Collections and other Illustrations; Some common Errors. It would be hard to find a secondary school teacher of botany anywhere who would not profit greatly by reading and digesting these brief essays. They abound in breezy, scientific common sense and suggest much that is new to most teachers.

Part II contains a scheme for a year's work in the laboratory. It deals largely with the physiological and somewhat with the ecological side of botany; the aspects most interesting to the average student. Many of the experiments and manipulations are wholly new, at least as regards their form, and the whole series is a practicable one. — J. Y. B.

[1] Duodecimo, viii and 270 pp. Macmillan & Co., New York, 1899.

Vol. 2, No. 13, including pages 1 to 26 and plates 12 to 14 was issued January 2, 1900.

NURSERYMEN'S DIRECTORY

ORNAMENTAL TREES, SHRUBS, VINES AND HERBACEOUS PLANTS. Seedlings and Transplanted Native Trees and Shrubs. Large and Well Developed Stock for Permanent Planting. Shade Trees from six to fifteen feet in height. Healthy and well-rooted. Strong Field-Grown Clumps of Hardy Perennials. Stock for Parks, Cemeteries and Suburban Places a Specialty. Send 6 cents in stamps for Descriptive Catalogue; contains Prices of large and Small Trees, and for Stock in quantities, and colored plate of New Hybrid Wichuariana Roses. THOMAS MEEHAN & SONS., Germantown, Philadelphia, Pa.

OLD COLONY NURSERIES, 1840–1899. Hardy Shrubs, Trees, Vines, Evergreens and Perennials. Priced Catalogue free on application. T. R. WATSON, Plymouth, Mass.

FRUIT AND ORNAMENTAL TREES at Reasonable Prices. Small Fruits, Grapes, Shrubs, Climbing Plants, Roses, Evergreens, Hardy Plants, Pæonies. Largest and choicest collections in America. Best Novelties. Descriptive Illustrated Catalogue free. ELLWANGER & BARRY, Mount Hope Nurseries, Rochester, N. Y. Fifty-ninth Year.

CONCORD NURSERIES, Concord, Massachusetts. Established on Minot Pratt's Homestead by his son, F. G. PRATT. Over 300 species grown, including *Rhodora*, pink and white, Andromedas, Cornels, Viburnums, Kalmias, Ivy, Myrica, Benzoin, Hamamelis. E. Mass. plants collected. Catalogue.

BEAUTIFUL BRIGHT-COLORED SPECIMENS OF THE ROCKY MOUNTAIN EVERGREENS: Picea Pungens, Picea Engelmanii, Abies Douglasii and Concolor. Also 300,000 twice transplanted Hemlocks and all other varieties of hardy evergreens. Ask for catalogue and mention this journal. Address D. HILL, Evergreen Specialist, Dundee, Ill.

WM. F. BASSETT & SON, Hammonton, N. J. General Collection of Hardy Plants and Hardy American Shrubs, collected and cultivated. Specialties: Plants of New Jersey Pine Region and eastern Pennsylvania. Hibiscus in var., Xerophyllum, Clethra, Schizæa, Droseras, Apios, Asclepias, Narthecium, Centrosema, Andromedas in var., Typha angustifolia. Catalogue.

REA BROTHERS, Norwood, Mass. — Viburnum tomentosum: A rare and beautiful shrub. **New and rare** Hardy Herbaceous Plants our specialty. Descriptive Catalogue of **Hardy Plants** Free. Special prices for collections and large quantities.

Advertisements of Nurserymen and Dealers in Botanical and other Scientific Publications are inserted in these pages at the following rates per space of 4 in. by $\frac{1}{4}$ in. 1 year, $4.00. 6 months, $2.50.

BOTANICAL PUBLICATIONS

SYNOPTICAL FLORA OF NORTH AMERICA, by A. GRAY and others. Vol. I. Fascicles 1 and 2. A critical treatment of forty-five families of polypetalæ (*Ranunculaceæ to Polygalaceæ*) 1895-1897. $5.20. — GRAY HERBARIUM of Harvard University, Cambridge, Mass.

FLORA OF MIDDLESEX COUNTY, MASSACHUSETTS, by L. L. DAME and F. S. COLLINS, 1888. Price $2.00, post free. — Address F. S. COLLINS, 97 Dexter Street, Malden, Mass.

FLORA OF MT. DESERT ISLAND, MAINE, by EDWARD L. RAND and JOHN H. REDFIELD. With a Geological Introduction by WILLIAM MORRIS DAVIS. 1894. Price, $2.00, post free. — Address EDWARD L. RAND, 53 State Street, Boston, Mass.

NEW ENGLAND WILD FLOWERS AND THEIR SEASONS, by WILLIAM WHITMAN BAILEY. Price 75 cents net. — PRESTON & ROUNDS CO., Providence, R. I.

AMERICAN GARDENING, A Weekly Illustrated Journal of Horticulture and Gardeners' Chronicle. Sample copies free. 136 Liberty St., New York.

THROUGH GLADE AND MEAD, A Contribution to Local Natural History, with a Flora of Worcester County, Massachusetts, by JOSEPH JACKSON. 1894. $2.00 (to subscribers to this journal). The Flora in separate form, 75 cents. — Address JOSEPH JACKSON, 15 Woodland Street, Worcester, Mass.

THE ASA GRAY BULLETIN, an illustrated botanical magazine. Special attention given to Cryptogams. Bi-monthly, 50 cents per year. Sample free if this journal is mentioned. — Address THE ASA GRAY BULLETIN, Takoma Park, D.C.

CAMBRIDGE BOTANICAL SUPPLY COMPANY, Cambridge, Mass. All books relating to Botany furnished, and Schools, Colleges, and Herbariums supplied. Estimates given.

STUDENTS' HAND-BOOK OF MUSHROOMS OF AMERICA. Edible and Poisonous, by THOMAS TAYLOR, M.D., author of Food Products, etc. Fine illustrations in color and in half-tone. Paper, $2.50; cloth, $3.00. —A. R. TAYLOR, Publisher, 238 Mass. Ave., N. E., Washington, D. C. Order through your bookseller, or send retail price to publisher.